Renewable Energy and Conservation Program

Montana Department of Natural
Resources and Conservation
December 1988

Report for the
51st Montana Legislature

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The Department of Natural Resources and Conservation operated the Renewable Energy and Conservation Program (RECP) over the past two years entirely on cash flow generated by loans and grants made in previous years. The program did not use any coal severance tax funds in the 1988-89 biennium and is not requesting any coal tax funds for the 1990-91 biennium.

Over the past two years under RECP, DNRC has:

(1)Worked on energy-saving retrofits on 13 state-owned buildings. Expected to cut the state's electricity and natural gas bills over $130,000 a year, the retrofits should pay for themselves in energy savings in six and a half years.

(2)Provided the required state matching funds that brought $738,887 in federal funds into Montana under four energy conservation programs.

(3)Closed out $1.2 million worth of renewable energy grants made in previous years.

The legislature established RECP to reduce the state's reliance on fossil fuels. The program originally involved grants to stimulate research, development, demonstration, and education on energy conservation techniques and renewable energy sources, including solar, wind, geothermal, small-scale hydro, and biomass. The program was later expanded to include funding for energy conservation retrofits of state-owned buildings and loans for commercialization of renewable technologies. Because energy conservation and biomass seem to be the most promising resources for Montana, the program emphasized them. In FY 1987, however, DNRC stopped making new grants and loans for several reasons, including state government's revenue shortfall, the general economic conditions in the state, the surplus of electricity in the Pacific Northwest, and the relatively high cost of developing renewable resources. At that time DNRC redirected the program to emphasize energy conservation measures for state-owned buildings. Although RECP has been scaled down, DNRC continues to reduce energy costs in state buildings and to provide Montanans with current information on energy technologies.

1. STATE BUILDINGS ENERGY PROGRAM

Funding for energy conservation measures, such as adding insulation and updating heating systems, for 13 state buildings was appropriated in the 1986-87 biennium. These projects will use a total of $632,418 in Renewable Energy and Conservation Program funding from the 1986-87 biennium; $91,482 in federal Institutional Conservation Program funds, and $126,807 in funds from other state agencies.

The work is complete on the Highway Department's Billings Headquarters Complex and three buildings at Montana State University in Bozeman (Romney Gym, Lewis Hall, and Gaines Hall). DNRC engineers are analyzing the

energy bills for these four projects; they are also working with the building operators to make sure the state gets all the energy savings possible. Although they don't have a full year's data yet on all of the buildings, the engineers estimate the four projects will save the state $52,900 a year on its electricity and natural gas bills.[1]

Contractors are designing and installing energy conservation measures on six residence buildings at the Developmental Center in Boulder, the dairy dormitory at the State Prison in Deer Lodge, the Social and Rehabilitation Services Department Building in Helena, and the Plentywood Armory. The energy conservation measures on these buildings are expected to save the state another $79,635 per year on energy costs, cutting the energy bills for those buildings 44 percent. The $346,080 worth of energy conservation measures on these buildings should pay for themselves in energy bill savings in an average of 4.3 years.

The buildings that received retrofits were chosen from 200 state-owned buildings with relatively high energy use. After an in-depth energy analysis of 22 buildings, DNRC selected the most cost-effective retrofit projects.

DNRC now is using oil overcharge funds[2] for energy-saving retrofits. In 1987 the legislature appropriated $1.985 million of oil overcharge funds to establish a revolving loan program for energy retrofits of state buildings.

The legislature appropriated another $120,000 in overcharge funds to conduct energy studies on state buildings to be retrofitted. With these funds DNRC this year signed contracts with four engineering firms to perform campus-wide studies of Warm Springs State Hospital, Montana State Hospital at Galen, the Montana Developmental Center at Boulder, and the Center for the Aged at Lewistown. Preliminary reports on the first three campuses indicate that an investment of about $3 million among the three campuses could yield as much as $500,000 a year in energy savings for the state.

Retrofits on only one or two of these campuses could be funded with the oil overcharge revolving loan fund, leaving two or three campuses unretrofitted, and the state owns another 10 million square feet of buildings that need energy conservation measures. The State of Montana now spends about $13 million a year to heat, cool, light, and operate its buildings. Based on the results achieved in earlier retrofits of Montana buildings, the state's energy bills can be reduced by $3-$6 million a year with an investment of $10.3 million in energy conservation measures.

Since the revolving loan fund would allow us to retrofit only one or two buildings a year, the state will continue to pay higher than necessary electricity and natural gas bills for years, adding up to millions of dollars. To enable the state to capture more of these savings, DNRC will propose to the 1989 legislature using the state's tax-exempt bonding authority to raise capital for energy conservation measures on state buildings. The program would be phased in over several years. The

results achieved in previous Montana projects clearly show that cost-effective energy conservation measures are a lucrative and reliable enough investment to merit use of state's bonding authority.

Once established, this program will be revenue neutral to state government and self sustaining. Operating and installation costs will be funded through bond sales, and energy savings will be used to repay the bond obligation. Once the bonds are retired, state government would continue to realize the savings throughout the rest of the life of the measures.

2. FEDERAL FUNDS

A portion of the Renewable Energy and Conservation Program funds is used as the required state matching funds for four federal programs--the State Energy Conservation Program, the Energy Extension Service, the Institutional Conservation Program, and the Biomass Utilization and Cogeneration Program. These energy conservation programs provide many of the services that were provided through RECP in previous years.

Under these four programs, DNRC provides services to a wide variety of Montanans, including: homeowners, renters, builders, wood products manufacturers and users, teachers, farmers, ranchers, home buyers, real estate agents, appraisers, lenders, commercial building owners and operators, engineers, architects, entrepreneurs, schools, hospitals, local governments, utilities, and other state agencies.

STATE ENERGY CONSERVATION PROGRAM & ENERGY EXTENSION SERVICE

Conservation and renewable energy technologies are changing rapidly; the State Energy Conservation Program and the Energy Extension Service provide the citizens of Montana accurate, up-to-date information on these technologies. DNRC is providing these services throughout the state with $51,920 in RECP funds, which are the required match for $285,236 in federal funds in the 1988-89 biennium. In addition, these federal funds are used to administer the $3,713,355 oil overcharge funds that were awarded to the state and appropriated to these programs by the 1987 legislature.

DNRC's comprehensive approach to encouraging energy conservation in new homes, carried out with funding from these programs and others, was named the best public information-energy awareness project in the country by the National Association of State Energy Officials this year. And DNRC's publication, "Warm Places: A Sampling of Energy-Efficient Montana Homes," won the top award in the booklets and manuals competition at the U.S. Department of Energy's 1988 All-States Energy Conference.

Another indication of the high caliber of DNRC's energy conservation programs is the fact that both Montana Power Company and the Western Area Power Administration have hired DNRC to conduct workshops for their customers.

INSTITUTIONAL CONSERVATION PROGRAM

The Institutional Conservation Program (ICP) used approximately $1.1 million in federal and oil overcharge funds this biennium for retrofit grants for schools and hospitals throughout the state. The institutions receiving the ICP grants matched them with over $1.4 million for the retrofits. RECP provided $62,988 in matching funds to administer the program this biennium.

Over the last ten years about $6.6 million in ICP funds were spent on over 100 Montana institutions. That money was matched with more than $6.6 million in funds from the institutions. Those investments generate an estimated $4.9 million each year in energy savings for participating Montana institutions--and Montana taxpayers.

BIOMASS UTILIZATION AND COGENERATION

The renewable energy resource that appears most promising for Montana is biomass, such as mill and forest residues, spoiled grains, manures, trash, and biogas from sewage plants. The Biomass Utilization and Cogeneration Program provides technical assistance and information to Montanans who want to use biomass as a source of energy and financial assistance for biomass technology development. Funded through the Bonneville Power Administration, the biomass program is using $12,349 in Renewable Energy and Conservation Program funds as part of the required match for $180,323 in federal funds. The biomass program requires that one-third of the money spent in each state be state money. DNRC reduced the amount of RECP matching funds required this biennium by counting as part of the required match some of the RECP grants awarded in previous years and still being paid out by DNRC. Since most of the renewable energy grant projects are complete, more RECP funds will be needed for the federal match in future years.

Among the projects funded or partially funded with this money are: using waste wood from logging projects to fuel large boilers or to make clean-burning wood pellets for residential wood stoves; evaluating the economic feasibility of small-scale wood chip and straw-burning equipment for Montana; and inventories of biomass resources in the state that could be used for energy. The biomass program also has provided grant funds to Renewable Technologies, Inc. of Butte for a commercial demonstration of a process for converting wood, straw, or trash into fuel alcohol. The process uses an enzyme developed with an RECP grant.

While answering over 500 biomass inquiries, DNRC engineers provided technical assistance which included helping start two wood pellet plants, helping several schools convert their furnaces to burn wood wastes for fuel, and helping two sawmills stay in business.

3. GRANTS AND LOANS

Although no renewable energy grants or loans have been made for new projects since FY 1987, DNRC did award a total of $897.50 this biennium to provide additional funds for an on-going wind monitoring project. The funds are for gathering additional information and doing more analysis of data gathered under previous years' grants. DNRC also awarded $20,172 in grants for the state buildings portion of the program this biennium.

In FY 1988 DNRC completed 15 renewable energy grants awarded in previous years. Another grant was closed out in the first half of FY 1989, and nine grant projects were still underway in December 1988.

Grants completed this biennium include: monitoring the indoor air quality, energy use, and heating and ventilating systems in superinsulated houses in Great Falls, Billings, and Lewistown; a study of the economic feasibility of using wind-powered irrigation systems in Montana; a demonstration of the cost effectiveness of installing energy conservation measures while retaining the historic aspects of the old Anaconda City Hall; construction of a prototype unitary steam engine that will burn several different types of renewable resources; and wind monitoring at Livingston, Ennis, Whitlash, Augusta, Ringling, and Whitehall.

The grants projects still underway include: using safflower oil as a substitute for diesel fuel; analyzing wind monitoring data from the Livingston Bench; and designing and building a sawdust-fired kiln to dry logs for log homes.

REPAYABLE GRANTS

Over the next few years, DNRC staff members will continue to closely monitor the results of several projects since the grants' terms call for the recipients to repay their grants if the projects become commercially successful.

One of the repayable grants involves a $39,186 award to a Potomac man for the design, construction, and demonstration of a commercial-sized furnace that can burn waste wood, chopped tires, oil tank sludge, municipal solid waste, and filter press waste from paper processing. In September a Los Angeles firm began building a series of four commercial prototypes of the furnace. The first prototype was a stainless steel model, which was tested for 60 days. Each successive prototype will be built with modifications based on testing. Columbia University has expressed interest in buying two of the furnaces to burn sewage sludge for heating digesters at the North River Water Pollution Control Center on the Hudson River.

Three of the repayable grants went to Renewable Technologies, Inc. (RTI) of Butte. Two grants totalling $418,473 were to develop an enzyme to make fuel alcohol from grain without cooking. In addition to producing

ethanol, the enzyme also makes barley more digestible for livestock. The enzyme was tested as a feed supplement for chickens in Canada and hogs in Germany; the Canadian tests indicate the enzyme-enriched barley gives better feed conversion than more expensive grains. RTI and a Minnesota firm want to package the enzyme with other enhancements for a super chicken feed additive for barley. RTI has built a pilot reactor that can produce 1,000 pounds of enzyme a day. Montana agricultural products are used to make both the enzyme and the feed or ethanol the enzyme helps create.

RTI also received a $69,962 repayable grant to develop two other ambient temperature enzymes--ligninase and cellulase. These enzymes break down the lignin bonds that surround cellulose, making it economically feasible to produce fuel alcohol from wood, straw, and trash. RTI plans a commercial-scale demonstration of the two enzymes later this year at either the Solar Energy Research Institute in Boulder, Colorado, or the Tennessee Valley Authority's testing facility at Muscle Shoals, Alabama. The demonstration will help identify the costs of producing ethanol with the enzymes on a commercial scale. RTI estimates that using ligninase and cellulase can bring the cost of making ethanol from wood, straw, and trash down below $1 a gallon.

RTI has used the system developed under the DNRC grants with different organisms and different products and now has contracts with several large corporations, including International Paper, to develop enzymes for food processing, paper production, biological insecticides and herbicides, starch processing, and dealing with industrial and municipal wastes.

LOANS

DNRC staff members continue to monitor 15 loans for projects such as expanding a wood pellet plant at Darby, a small hydro-electric plant on an irrigation system near Red Lodge, and expansion of a Bozeman business that sells and installs solar and conservation products. All of the loans are scheduled to be repaid by August 27, 1996. Ten of the loans are being paid back on a regular schedule, and five loans are in various stages of renegotiation or foreclosure.

CONCLUSION

The Renewable Energy and Conservation Program has changed substantially to meet rapidly changing technology and economic circumstances over the last decade. Lower oil prices have undermined the economic competitiveness of many renewable energy technologies. Through the years DNRC has concentrated on the most promising, cost-effective renewable technologies and on cost-effective conservation improvements to state-owned buildings. As state budgets tightened, DNRC has relied increasingly on federal funds to provide these high priority services, using limited state money primarily to leverage federal dollars.

In addition to cutting the state's energy bills, the Renewable Energy and Conservation Program continues to reap the benefits of grants and

loans made in previous years. Projects such as the enzyme research by RTI in Butte and the commercial-scale biomass furnace developed in Potomac continue to provide jobs and may provide grant repayments as the technologies are commercialized.

Despite the current economic conditions, investments in energy efficiency and renewable energy can be cost effective if properly structured. Nationally the growing concern over global warming and acid rain is placing renewed emphasis on energy efficiency. With a minimal investment of funds generated through grant and loan repayments, DNRC continues to provide information, technical assistance, energy savings, and increased energy efficiency throughout Montana.

FOOTNOTES

[1]These savings projections are down from the $64,000 originally predicted for these projects because: 1) some of the energy-saving measures weren't installed; 2) Montana Power Company lowered the rate it charges for natural gas; and 3) activities carried out in one building were changed.

[2]As the result of overcharges on the sales of domestic crude oil, the federal courts ordered or approved settlements requiring the repayment of the total amount of overcharges plus interest into an escrow account to be distributed by the U.S. Treasury to the states. The Montana Legislature appropriated some of the state's oil overcharge money to DNRC for energy programs.